claims, wherein underlined text represents additions and strikethrough text indicates deletions.

The Applicants submit corrected drawings with this Amendment that comply with 37 CFR § 1.121(d). A new declaration in compliance with 37 CFR § 1.67(a) shall follow in a separate communication. The Applicants have amended independent Claims 1, 11 and 13 to claim the subject matter of the Application in a more narrow and precise manner.

The Examiner has rejected Claims 1 through 13 under 35 USC § 112, first paragraph, for alleged failure to comply with the written description requirement. In particular, the Examiner alleges that the characterisation of the claimed lubrication system as "non-recirculating" is ambiguous. The Applicants traverse this rejection for the hereinafter described reasons as well as the hereinbefore described amendments to the claims.

The Applicants assert that the meaning of the term is clear from the context of the specification, that the pressurised tank/bladder lubrication source or reservoir does not have a recirculating path of lubricant. In other words, the Applicants give this the "narrow interpretation" of the term that the Examiner refers to. However, in order to comply with the Examiner's rejection, the Applicants have removed this term altogether and replaced it with the completely unambiguous term "compressed gas powered" in amended independent Claims 1, 11 and 13.

There is complete support for this terminology in the specification. See the description of the lubricating oil source 46, page 8, line 14 through page 9, line 19. In any case, such a gas powered lubrication system is still non-recirculating since it can only expel any stored lubricant in the source upon application of gas pressure, so the Applicants assert that the scope of amended Claims 1, 11 and 13 remain unchanged. Therefore, in view of the amendments to these claims and the hereinbefore stated reasons, the Applicants respectfully request that the Examiner reconsider and withdraw the rejection of these claims under 35 USC § 112. Claims 2 through 10 depend from amended independent Claim 1. Claim 12 depends from independent Claim 11. Therefore, the Applicants respectfully request that the Examiner reconsider and withdraw the rejection

of these dependent claims for the same hereinbefore described reasons as amended Claims 1, 11 and 13 as well as for their own additional limitations that distinguish them from the prior art.

The Examiner has rejected Claims 1 through 7, 10 and 13 under 35 USC § 103(a) for alleged obviousness over McCarty in view of Zankl and optionally in view of Swearingen. The Applicants traverse this rejection for the hereinafter described reasons.

The Applicants acknowledge McCarty as representative of a prior art non-recirculating type of lubrication system for lubricating the bearings of a gas turbine engine. The claimed invention is an improvement upon McCarty, insofar as McCarty fails to have any control system for metering the flow of lubricant to the engine bearings. Lubricant flow rate is at the mercy of air pressure exerted on the lubricant in the reservoir 34 and the fixed restrictions in the nozzles 38 and 40. McCarty obliquely refers to Swearingen as an accumulator-based emergency lubrication system for a recirculating main lubrication system that supplies lubricant to the accumulator. As McCarty makes clear, it is dependent for its operation on the presence of the main lubrication system to keep the accumulator filled and it is inappropriate for expendable applications. Also, the reserve lubricant supply system described in Swearingen, like McCarty, fails to have any control system for metering the flow of lubricant to the engine bearings.

In contrast to both McCarty and Swearingen, the claimed invention, as recited in independent Claims 1, 11 and 13, states, amongst other things:

a solenoid operated valve in said conduit and operable only to either fully open or fully close; and

a control circuit for pulsing said solenoid at a controlled rate to alternatingly (a) allow oil flow and (b) halt oil flow to said bearings for a time insufficient to cause oil starvation of said bearings.

Neither McCarty nor Swearingen have any such control system features. Of course, the Examiner refers to Zankl. The Examiner says:

"Zankl teaches it is old and well known in the lubrication art to employ a computer controlled solenoid valve 20, 22 and metering orifice 36 for pulsing the valve open and close [sic] in order to precisely meter the amount of lubricant to a drive shaft (which generally has to have bearings) and a control circuit for pulsing the solenoid at a controlled rate to alternatingly (a) allow oil flow and (b) halt oil flow to said bearings for a time insufficient to cause oil starvation of said bearings."

The Examiner should read Zankl more carefully. Citation of Zankl is entirely inappropriate. Zankl only describes an automatic lubrication system for the slide ways and feed screws for machine tools. There is no mention anywhere in the specification for lubrication of any other purpose, or that such a lubrication system is suitable for any other purpose. See Figure 1 as well.

The claimed invention, as set forth in the preamble of independent amended Claims 1, 11 and 13, relates to a "compressed gas powered lubrication system for an expendable gas turbine engine". Lubrication systems for slide ways and feed screws in machine tools have vastly different lubrication requirements than the demanding requirements of bearings in an aeronautical gas turbine engine. The bearings in a gas turbine engine retain a drive shaft that rotates at thousands of revolutions per minute at elevated temperatures. Lubrication systems for the slide ways and feed screws in machine tools only require an occasional application of lubricant onto the surface of the ways or feed screws, since they operate at much lower speeds and at ambient room temperatures.

In fact, many machine tools have manual "one shot" lubrication options because the lubrication requirement is so much more lax. In support of this assertion, the Applicants provide the attached description of the K.O. Lee Model S1024N3 surface grinder. On page 4, under the heading "Manual or Electrical Lubrication System", the description states:

"Manual one-shot. Electric pump on time. Main friction points such as feed screws and way surfaces receive correct amount of new lube. Gravity storage for used oil."

This description indicates that not only is the lubrication system only for ways and feed screws, as Zankl and the Applicants assert, but that these lubrication requirements are relatively lax as well.

Of course, Zankl does refer to a three-axis machine tool in the specification. The "lubrication system" that such machines use, even at the present time, still means a lubrication system for only the guide ways and feed screws. In support of this assertion, the Applicants provide a description of a three-axis Amera-Seiki A-3 CNC vertical machining centre as offered by Welsh Machinery, Inc. On page 4, under the heading "Automatic Lubrication System", the description states:

"Delivers a constant and measured flow of oil to the guide ways and ball screws."

Therefore, it is inappropriate for the Examiner to refer to a general "lubrication art" in citing Zankl and stating that Zankl describes a lubrication system for a drive shaft and associated bearings when it clearly does not. Lubrication systems for "an expendable gas turbine engine" as recited in independent Claims 1, 11 and 13 are distinctly different in use and requirements, and therefore art, than lubrication systems for guide ways and feed screws for machine tools. The fact that the Examiner could not cite a single gas turbine lubrication system reference with a digitally modulated control system using a solenoid valve as claimed, even thirty two years after the issuance of Zankl, is a good indication that the claimed system is not obvious for gas turbine lubrication systems. For these hereinbefore stated reasons, the Applicants respectfully request that the Examiner reconsider and withdraw the rejection of these claims under 35 USC § 103(a).

The Examiner has also rejected Claims 8, 9, 11 and 12 under 35 USC § 103(a) for alleged obviousness over McCarty in view of Zankl and optionally in view of Swearingen as hereinbefore described in connection with Claims 1 through 7, 10 and 13, and further in view of Waddington et al. The Applicants assert that these claims are distinguishable from the prior art for the same reasons as hereinbefore described for Claims 1 through 7, 10 and 13. Furthermore, although the Applicants acknowledge that Waddington et al. describes a lubrication system that is responsive to lubrication pressure, ambient pressure and altitude, the described control system requires a pump-powered

recirculating lubrication system with a sump reservoir 22 and lubricant flowing through a return line 100 to the reservoir 22. See Figures 1 and Figure 4. Thus, this system is too complex and wasteful of lubricant to be useful for an expendable gas turbine engine. For these hereinbefore stated reasons, the Applicants respectfully request that the Examiner reconsider and withdraw the rejection of these claims under 35 USC § 103(a).

In view of the amendments to independent Claims 1, 11 and 13 and the hereinbefore described reasons, the Applicants respectfully request that the Examiner reconsider and withdraw the rejections of Claims 1 through under 35 USC § 112, first paragraph, and 35 USC § 103(a). The Applicants further respectfully request that the Examiner find the Claims 1 through 13 in condition for allowance.

Respectfully submitted,

Stephen G. Mican

Stephen G. Mican
Attorney for the Applicants
Reg. No. 31, 983
Phone: 312 324 0126
E-mail: stephen@mican.org.uk

CERTIFICATE OF MAILING

I hereby certify that I have deposited this correspondence with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on 22 August 2006.

By: Stephen G. Mican

APPENDIX

IN THE CLAIMS

Amend Claim1 as follows:

1. (Twice Amended) A ~~non-recirculating~~ compressed gas powered lubrication system for an expendable gas turbine engine comprising:

a rotatable shaft within said turbine engine;

bearings journaling said shaft for rotation about an axis;

a tank;

a bladder within said tank;

a source of gas under pressure;

one of said tank and said bladder containing lubricating oil for said bearings;

the other of said tank and said bladder being connectable to said source of gas under pressure;

a conduit extending from said one of said tank and said bladder containing lubricating oil to said bearings;

a solenoid operated valve in said conduit and operable only to either fully open or fully close; and

a control circuit for pulsing said solenoid at a controlled rate to alternatingly (a) allow oil flow and (b) halt oil flow to said bearings for a time insufficient to cause oil starvation of said bearings.

2 (Original) The lubrication system of claim 1 wherein said one of said tank and said bladder is said tank.

3. (Original) The lubrication system of claim 1 wherein said one of said tank and said bladder is said bladder.

4. (Original) The lubrication system of claim 1 wherein said time is no more than about three seconds.

5. (Original) The lubrication system of claim 1 further including a metering orifice in said conduit between said bearings and said solenoid valve.

6 (Original) The lubrication system of claim 1 further including a pressure regulator operatively interposed between said other of said tank and said bladder on the one hand and said source of gas under pressure on the other hand.

7 (Original) The lubrication system of claim 6 wherein said pressure regulator receives an input representative of pressure at said bearings.

8. (Original) The lubrication system of claim 1 wherein said engine is mounted in a vehicle and said control circuit receives inputs representative of vehicle velocity and temperature of the lubricating oil.

9. (Original) The lubrication system of claim 1 wherein said vehicle is an airborne vehicle and said control circuit receives an input representative of the altitude of the vehicle.

10 (Original) The lubrication system of claim 1 wherein said tank is in sufficiently close proximity to said engine so as to receive heat rejected thereby so that lubricating oil is warmed by engine operation to reduce its viscosity.

Amend Claim 11 as follows:

11. (Twice Amended) A ~~non-recirculating~~ compressed gas powered lubrication system for an expendable gas turbine engine in an airborne vehicle engine comprising:

a rotatable shaft within said turbine engine;

bearings journaling said shaft for rotation about an axis;

a tank;

a bladder within said tank;

a source of gas under pressure;

one of said tank and said bladder containing lubricating oil for said bearings;

the other of said tank and said bladder being connectable to said source of gas under pressure;

a pressure regulator interconnecting said source of gas under pressure and said other of said tank and said bladder;

a conduit extending from said one of said tank and said bladder containing lubricating oil to said bearings;

a solenoid operated valve in said conduit and operable only to either fully open or fully close;

a metering orifice in said conduit between said solenoid operated valve and said bearings;

a control circuit for pulsing said solenoid at a controlled rate to alternatingly (a) allow oil flow and (b) halt oil flow to said bearing for a time insufficient to prevent oil starvation of said bearings; and

said control circuit receiving inputs representing vehicle velocity, vehicle altitude and lubricating oil or ambient temperature.

12. (Original) The lubricating system of claim 11 wherein said pressure regulator is connected to receive a control input representing pressure at said bearings.

Amend Claim 13 as follows:

13. (Twice Amended) A ~~non-recirculating~~ compressed gas powered lubricating system for an expendable gas turbine engine comprising:

a rotatable shaft within said turbine engine;

bearings journaling said shaft for rotation about an axis;

a vessel containing lubricating oil;

a conduit extending from said vessel to said bearings;

a solenoid operated valve in said conduit and operable only to either fully open or fully close; and

a control circuit for pulsing said solenoid at a controlled rate to alternatingly (a) allow oil flow and (b) halt oil flow to said bearings for a time insufficient to cause oil starvation of said bearings.